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Title:

Regional inequalities in self-reported conditions and non-communicable diseases in European countries: Findings from the European Social Survey (2014) special module on the social determinants of health

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34

35 **Abstract**

36 **Background:**

37 Within the European Union (EU), substantial efforts are being made to achieve economic and social
38 cohesion, and the reduction of health inequalities between EU regions is integral to this process. This
39 paper is the first to examine how self-reported conditions and non-communicable diseases (NCDs) vary
40 spatially between and within countries.

41 **Methods:**

42 Using 2014 European Social Survey (ESS) data from 20 countries, this paper examines how regional
43 inequalities in self-reported conditions and NCDs vary for men and women in 174 regions (level 1 and 2
44 Nomenclature of Statistical Territorial Units, 'NUTS'). We document absolute and relative inequalities
45 across Europe in the prevalence of eight conditions: general health, overweight/obesity, mental health,
46 heart or circulation problems, high blood pressure, back, neck, muscular or joint pain, diabetes and cancer.

47 **Results:**

48 There is considerable inequality in self-reported conditions and NCDs between the regions of Europe, with
49 rates highest in the regions of continental Europe, some Scandinavian regions and parts of the United
50 Kingdom and lowest around regions bordering the Alps, in Ireland and France. However, for mental health
51 and cancer, rates are highest in regions of Eastern European and lowest in some Nordic regions, Ireland and
52 isolated regions in continental Europe. There are also widespread and consistent absolute and relative
53 regional inequalities in all conditions within countries. These are largest in France, Germany and the United
54 Kingdom, and smallest in Denmark, Sweden and Norway. There were higher inequalities amongst women.

55 **Conclusion:**

56 Using newly available harmonized morbidity data from across Europe, this paper shows that there are
57 considerable regional inequalities within and between European countries in the distribution of self-
58 reported conditions and NCDs.

59

60 **Keywords**

61 Health inequalities

62 Europe

63 Morbidity

64 Spatial

65 Geography

67 **1. Introduction**

68 Reducing regional inequalities in Europe, including those associated with health, was a founding aim in the
69 ECC Treaty of 1957 and reaffirmed in the 2007 Lisbon Treaty which promoted 'economic, social and
70 territorial cohesion' through ever more regional and national harmonisation. Despite the long standing will
71 of the European Community and member states to assimilate, inequalities in health have remained high.
72 Whilst most research to date had focused on understanding inequalities between European countries ¹⁻³,
73 the work of Shaw et al.⁴ has shown that using national health data can mask significant within country,
74 regional variation. For example, it is well established that there is a North-South health divide in England ⁵,
75 ⁶, whilst the East-West divide in Germany has reduced significantly since reunification in respect to both
76 morbidity and mortality ⁶⁻⁸. In addition, Richardson et al. ⁹ demonstrated that there are also significant
77 regional inequalities in life expectancy across Europe.

78

79 Most previous comparative studies including Richardson et al.⁹, use data collected by separate national
80 administrations which may give rise to inconsistencies, particularly concerning data related to morbidity
81 outcomes which may need to be harmonised. Our research uses data from the special module on the
82 social determinants of health of the 2014 European Social Survey (ESS) and documents for the first time
83 how various self-reported conditions and non-communicable diseases (NCDs) vary at sub-national level
84 using data from a single source. Specifically, we investigate the geographical distribution of eight self-
85 reported conditions and NCDs within European countries, and the scale of any regional inequalities within
86 each country using data from the 2014 ESS.

87

88 **2. Methods**89 **Data**

90 This study involved the analysis of the ESS conducted in 2014 (round 7). The data and documentation on
91 the survey are provided freely and can be accessed through the ESS website
92 (<http://www.europeansocialsurvey.org>). Data were gathered in 20 countries within Europe. Whilst most
93 countries are in the European Union (Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France,
94 Germany, Hungary, Ireland, Lithuania, Netherlands, Poland, Portugal, Slovenia, Spain, Sweden, and the
95 United Kingdom), others are in the European Free Trade Association (Norway and Switzerland). Random
96 probability sampling from all private households with persons aged 15 and over was completed between
97 August 2014 and December 2015. The average response rate was 51.6% for all countries in the ESS, but

98 ranged from 31.4% in Germany to 68.9% in Lithuania. This paper draws its data from the rotating module
99 'Social inequalities in health and their determinants' described in detail in Eikemo et al. ¹⁰. A range of
100 conditions were asked within the rotating module, including information on general health, limiting
101 longstanding illness, BMI, mental health and self-reported NCDs. Eight variables were investigated in this
102 paper; general health, overweight/obesity, mental health and heart or circulation problems, high blood
103 pressure, pain, diabetes and cancer (Table 1). These were chosen as they represent some of the biggest
104 public health issues which are facing Europe in 21st Century.

105

106 *****TABLE 1 INSERTED HERE*****

107

108 In keeping with previous research ⁹, regions were determined using the 'Nomenclature of territorial units
109 for statistics' (NUTS) classification. NUTS is a hierarchical system for dividing up the economic territory of
110 the EU. Areas are divided into three levels based on population, country administrative divisions or
111 geographical units; NUTS 1, NUTS 2 or NUTS 3. NUTS 2 regions (with a typical population of 800,000 to 3
112 million) were used everywhere other than Germany and the UK which only release their data at the NUTS 1
113 level (population 3 – 7 million).

114

115 **Analysis**

116 Prevalence was calculated for each of the self-reported conditions and NCD variables at sub-national
117 regions for respondents aged 18 plus¹. Results are presented for all the population, and men and women
118 separately. To calculate the regional prevalence of each condition across Europe, all data are weighted
119 using two weights reported in the ESS: the population size (*pweight*) weight corrects for different
120 population sizes between countries, and this was combined with a post-stratification weight (*pspweight*)
121 which uses information on age-group, gender, education, and region to reduce the sampling error and
122 potential non-response bias of the survey. To facilitate the comparison of regional prevalences across
123 Europe which may have different population structures, we adjusted the crude prevalences in each area for
124 five year age groups (up to aged 75 and above which were amalgamated) to a standard population (in
125 keeping with the reporting of country prevalences by Huijts et al. ¹¹). The age groups were weighted in
126 accordance with the European Standard population (ESP) of 2013 ¹², which is an updated version of the
127 1976 ESP taking into account an aging European population. The ESP 2013 is available in spreadsheet
128 format from ISD Scotland ¹³. Within country, regional inequalities did not used the *pweight* and were not

¹ Respondents aged 15-17 (representing 3.1% of the ESS sample) were excluded from the analysis to ensure maturation of all participants and validity of the Body Mass Index calculation using height and weight alone.

129 age-standardised (as comparison between countries is not required and the *pspweight* does account for
130 some regional differences). Sensitivity analysis using country-level population (obtained from Eurostat)
131 showed the difference between regional prevalences were typically less than 1% different to those using
132 the ESS weights alone and therefore not pursued further in subsequent analysis.

133

134 For regional analysis, a sample size of at least 100 respondents per NUTS region was required, and/or a
135 minimum of 20 cases for each item in the instrument. The analysed data are represented in map, graphical
136 and tabular form. Mapping was completed in ArcMap 10.3 using administrative boundaries downloaded
137 Eurostat/EuroGeographics. For visualisation purposes, regions were aggregated into deciles based on cut-
138 offs which include equal numbers of areas in each self-reported condition and NCD. To document regional
139 inequalities, countries with fewer than five NUTS 2 (or NUTS 1) regions were excluded from analysis
140 (following Bambra et al. ¹⁴). This had the consequence that for some more rare conditions (e.g. diabetes),
141 and particularly when examining prevalences of men and women separately, not all regions and/or
142 countries sampled are included in the final analysis.

143

144 To calculate country-level regional inequalities, the absolute difference in prevalence between the region
145 with the lowest and highest incidence of the particular health outcome investigated was also calculated,
146 and tested for significance. This 'risk difference' was considered alongside the relative risk (or risk ratio)
147 which calculates the ratio of risk of an event in the two regions. For all variables, the lowest regional
148 prevalence was considered the 'exposed' group and was divided by the highest regional prevalence (the
149 'unexposed' group). As such, all risk ratios for this analysis are less than 1. To further quantify the scale of
150 within-country inequalities, as an example, we calculate for the overweight/obese data the absolute
151 weighted mean difference from the overall mean. This shows the difference of health in each region
152 (weighted) from a reference point. Whilst a variety of measures to quantify subnational regional
153 inequalities are available, the mean difference from the mean was chosen as it can be easily communicated
154 to non-technical audiences ¹⁵. As the ESS data were not purposively sampled at the regional level, we used
155 population data for females and males respectively direct from Eurostat (table: demo_r_d22jan) for only
156 those regions with sufficient data. The national coverage was calculated using only data for these regions
157 in addition. Higher numerical values indicate more widespread inequalities.

158

159 *****FIGURE 1 INSERTED HERE*****

160

161 3. Results

162 Regional prevalence of self-reported conditions and NCDs across Europe

163 Figure 1 shows regional variation in self-reported conditions and NCDs for the total population in 20
164 countries included in the ESS (the raw data showing prevalences at NUTS 1/2 level is available from the
165 corresponding author on request). Overall it is clear not only that all conditions affect substantial
166 proportions of respondents, but we also see considerable variation in prevalences both across Europe and
167 within individual countries. Direct comparison between all regions sampled in the ESS is however not
168 possible as some data had to be excluded due to low sampling counts (illustrated using cross hatching on
169 maps presented). Poor general health is highest in Hungary and in some eastern and southern European
170 countries and lowest in Switzerland, Austria, and Ireland. For example in Észak-Magyarország (Hungary),
171 the rate of poor general health is 19.24% compared to *ca.* 1% in Espace Mittelland in Switzerland. The
172 prevalence of overweight/obesity is more spatially heterogeneous, with rates highest in parts of the United
173 Kingdom, Scandinavia and central Germany and lowest in urban areas of Germany and Switzerland (e.g.
174 Berlin, Zurich), Poland and central and north-west France. The prevalence of depressive symptoms is
175 highest in parts of Hungary, Germany, Czech Republic and parts of Spain and Portugal where rates can
176 reach > 30% and lowest in parts of Scandinavia (e.g. Agder and Rogaland in Norway 3.99%) and Switzerland.
177 Heart and circulation problems are also spatially variable within regions of the EU with a range of over 17%
178 between the least and most affected regions. For example in Wales (UK), only 3.37% of respondents
179 reported problems during the past 12 months compared to the Thüringen region of Germany which has a
180 rate of 21.15%. Problems associated with high blood pressure also show considerable regional variation
181 across Europe ranging from less than 5% in Salzburg in Austria to around 40% in the Thüringen and the
182 Sachsen-Anhalt areas of Germany. Rates of back or neck/ muscular or joint pain in the hand/arm or
183 foot/leg however show the greatest range amongst the eight self-reported conditions reported here. The
184 lowest rates are reported in parts of Hungary, the Czech Republic and Poland where typically less than 30%
185 of the total population aged over 18 reports some kind of pain in the past 12 months compared to regions
186 of France, Belgium and Sweden for which the percentage is considerably higher at around 80% of survey
187 respondents. The prevalence of diabetes also displays a distinct patterning with the worst affected regions
188 centring on northern Germany, Portugal, northern Finland, and parts of the United Kingdom with rates
189 lowest in southern Germany and Switzerland. Finally, those survey respondents reporting cancer also
190 varies across the regions of Europe: Poland, Spain and some Scandinavian regions report the lowest
191 prevalences with rates highest in Hungary and Switzerland.

192

193 Although there are considerable regional differences amongst the eight self-reported conditions and NCDs
194 examined here, some broad trends are evident in the maps presented in Figure 1. For self-rated health,

195 overweight and obesity, high blood pressure, pain (and a lesser extent diabetes), the prevalence of the
196 particular condition of interest is highest in continental Europe (centred on North/East Germany), high also
197 in some Scandinavian regions and parts of the United Kingdom and lowest around countries bordering the
198 Alps, Ireland and some regions in France. No clear east-west gradient is evident, with prevalences showing
199 considerable geographic variability between and within individual countries although for the maps of
200 mental health and cancer, rates are highest in regions of Eastern European countries and lowest in some
201 Nordic regions, Ireland and isolated regions in continental Europe.

202

203 *****FIGURE 2 INSERTED HERE*****

204

205 **Within country regional inequalities in self-reported conditions and NCDs**

206 Bar graphs of within-country absolute regional inequalities (high to low) for the total population in the eight
207 conditions examined in this paper are detailed in Figure 2 (and full tables of all country-level regional
208 inequalities for the total population, and men and women reported separately are displayed online in
209 Additional file 1). For most of the conditions, the highest regional levels of inequality are found in France,
210 Germany, the United Kingdom, Hungary and Austria. For example, the difference between the highest
211 (Thüringen) and lowest (Rheinland-Pfalz) regions with a CES-D 8 depression score is 23.76%. France also
212 displays persistent absolute inequality in many of the variables, for example there was a difference of
213 11.95% of respondents who have or have had heart or circulation problems between regions. In the Midi-
214 Pyrenees region, just 5.83% of respondents claimed to have heart or circulation problems, compared to
215 Aquitaine which had 17.78%. In comparison, Sweden, Denmark, Switzerland and Norway showed some of
216 the smallest regional inequalities in self-reported conditions. There was only a 6.27% difference between
217 Roskilde County and Frederiksborg County (Denmark) in pain. Furthermore, the eight valid regions of
218 Sweden had a difference in overweight/obese status of just 12.03%, compared to Germany where this
219 figure more than doubles (28.76%).

220

221 *****TABLE 2 INSERTED HERE*****

222

223 For some of the self-reported conditions it was possible to use the data from the ESS to investigate how
224 regional inequalities vary between men and women. Unfortunately for many of the variables, the low
225 sampling counts meant this was only meaningful for some of the most prevalent conditions (e.g.
226 overweight/obese status). However, by combining the overweight/obese category we mask the difference

227 in health by different BMI categories¹⁶. Nevertheless, Figure 3 shows higher inequalities amongst women
228 as reported elsewhere ¹⁷, and also significant regional variability between the sexes. For example women in
229 Norway showed the highest levels of inequalities in overweight/obesity amongst countries in the ESS, with
230 a difference of 36.75% between the most and least obese regions. In comparison, the men of Norway
231 displayed the lowest levels of overweight/obesity with a regional difference of just 6.25%. The situation
232 was reversed for United Kingdom where men had higher absolute and relative inequalities compared to
233 women.

234

235 *****FIGURE 3 INSERTED HERE*****

236

237 The relative risk between the regions reporting the lowest and highest values for each of the self-reported
238 conditions is shown in Table 2. Relative risks closest to 1 indicate little difference between regions, with
239 those values closest to 0 indicating countries with the greatest inequalities. For example, in the United
240 Kingdom, the region with the least prevalence of overweight/obesity (Greater London) had a risk of 0.634
241 of having a BMI greater than 25 compared to the region reporting the highest prevalence (North East) – or
242 37% less chance. The significance of the within-country regional inequalities using risk difference (where p
243 < 0.05) is illustrated for each self-reported condition using an asterisk. From the table it is evident that
244 regional inequalities are widespread and significant in France, Germany, the United Kingdom (and to a
245 lesser extent in Spain, Poland and Hungary). Relative regional inequalities are not significant in Denmark
246 and to a lesser extent Sweden and Norway. To illustrate the scale of inequalities across all regions, the
247 weighted mean difference from the mean has been applied to the overweight/obese data (Table 3). The
248 countries are ordered by the greatest absolute difference (low to high). It is evident that those countries
249 with the greatest absolute difference generally also have high weighted mean difference calculations
250 suggesting that inequalities are persistent across all regions. For example, women in Norway and
251 Switzerland have the highest and lowest absolute inequalities between regions respectively and also the
252 greatest (and least) inequalities across all regions. However women in Spain and men in Hungary for
253 example, have a much higher weighted mean difference compared to their high to low absolute difference
254 indicating widespread regional differences in the prevalence of overweight/obesity.

255

256

257 4. Discussion

258 The results presented here present a first examination of European regional inequalities in the prevalence
259 of a range of self-reported conditions and NCDs from the new special rotating module on social inequalities
260 in health developed for the 7th wave of the ESS (2014). Overall, we found considerable regional differences
261 in prevalences amongst the eight self-reported conditions investigated within the European area. Most
262 importantly, we found country-level regional inequalities are most noticeably smaller in some countries
263 (e.g. Denmark) and larger and statistically significant in others (e.g. Germany, France and the United
264 Kingdom). The study of regional geographic variations in health outcomes is still in its infancy, and this
265 paper provides a unique overview of the extent and scale of regional variability between and within 20
266 countries in the European region. The significant regional variability illustrated in this paper underlines the
267 importance of examining smaller geographic units when documenting health outcomes, something which is
268 largely ignored in most comparative studies which typically report country-level health outcomes.

269

270 Our findings are largely in keeping with previous single country studies of regional inequalities in health. For
271 example, research conducted in Germany, Finland and the UK has highlighted how distinct regional
272 differences in diabetes prevalence are evident ¹⁸⁻²⁰, potentially attributable to underlying structural
273 deprivation operating at the contextual regional level, as well as compositional variables related to the
274 socio-economic status or ethnic composition of the population living in these areas ^{18, 21}. However, there
275 are some differences in the results described here with more detailed analysis conducted within individual
276 countries. For example, the prevalence of depressive symptoms was 3.99% in Agder and Rogaland
277 however research from the Norwegian Institute of Public Health ²² has highlighted Agder has a higher
278 incidence of psychiatric symptoms and disorders than the rest of Norway, particular in younger age groups.
279 Whilst this discrepancy could be associated with the self-reporting in the ESS compared to clinical
280 diagnosis, is maybe a function of the sampling design, particularly the small number of cases in some
281 regions. Also, for some countries (Denmark, Germany, Poland, Portugal, Slovenia, Spain, Sweden and the
282 United Kingdom) statistical inference is not possible at the regional level (see 'ESS7 – 2014 Documentation
283 Report' for further details ²³). As such, caution should be exercised when interpreting results, and comparison
284 to more comprehensive national studies should be undertaken alongside the analysis regional level
285 described here. The ESS was never sampled for analysis at the regional level, so it may be possible that the
286 respondents are not representative of the population at sub-national level. However, for all analyses the
287 *pspweight* was used which incorporated information on age-group, gender, education as well as region to
288 ensure these effects are minimised. However, the heterogeneity of self-reported health outcomes in small
289 areas of Europe found in our study raises the possibility that regional-level health inequalities are reflecting
290 underlying spatial differences in socioeconomic conditions. Therefore further analysis should focus on
291 trying to explain these variations using modelling techniques incorporating compositional and contextual
292 variables to understand the drivers of regional differences in self-reported conditions and NCDs.

293

294 This paper provides a unique insight into the extent of regional inequalities in self-reported conditions and
295 NCDs over most of Europe by using a comparable dataset for 20 European countries. However, there are
296 some limitations associated with the design and analysis of the data which may have methodological
297 implications. Firstly, the low sampling counts for some of the self-reported conditions is a limitation of this
298 study, in part due the pattern of sampling within the ESS which was not designed for complete and
299 representative regional analysis. Consequently, for some of the self-reported conditions which are less
300 common (such as diabetes or cancer), there are many regions for which comparison was not possible. For
301 the same reason, documenting gender differences in many of the health outcomes is problematic except
302 for the most common health outcomes (e.g. overweight/obesity), for which there are sufficient data.
303 Secondly, whilst the focus of analysis was NUTS 2, for the United Kingdom and Germany only data at NUTS
304 1 was available. The unit of analysis (and the number of country subgroups) would change the prevalence
305 of some of the regional analysis displayed here, particularly considering within-country regional
306 inequalities. In the same way, even amongst the NUTS 2 regions, there are significant population
307 differences in regions which would undoubtedly have implications for the results presented here. For
308 example, the Luxembourg Province in Belgium has a population of 278,651, compared to La Réunion in
309 France which has 839,334 people in 2014²⁴. The low (and varying) response rate may also influence the
310 results presented here. Whilst weighting is used to adjust for this potential bias, it is unclear without
311 detailed knowledge of geographical distribution of health outcomes at country level, whether these are
312 sufficient. Furthermore, whilst calculating the within-country regional differences, only the lowest and
313 highest regional values for calculating risk difference and risk ratio are used across all health outcomes.
314 This masks the scale and depth of inequality in any one country. Our analysis therefore measures the
315 health 'gap' between regions. However our preliminary investigation using the absolute weighted mean
316 difference suggests that for overweight/obesity the pairwise measure of high to low absolute difference is a
317 reasonable approximation of the scale and depth of regional inequality across a country. Future work could
318 focus more on the gradient, examining the possible role of deprivation (using for example the Slope Index
319 of Inequality and Relative Index of Inequality) in the patterns we have found. Finally, the ESS uses self-
320 reported data on NCDs, rather than clinical diagnosis.

321

322 5. Conclusion

323 This paper has examined how the prevalence of self-reported conditions and NCDs varies spatially between
324 and within countries using a unique new harmonised data set: the European Social Survey special module
325 on health inequalities in Europe from 2014. We have found that there is considerable inequality in
326 conditions between the regions of Europe, with rates highest in the regions of continental Europe, some

327 Scandinavian regions and parts of the United Kingdom and lowest around regions bordering the Alps, in
328 Ireland and France. However, for mental health and cancer, rates are highest in regions of Eastern
329 European and lowest in some Nordic regions, Ireland and isolated regions in continental Europe. There are
330 also widespread and consistent absolute and relative regional inequalities in all self-reported conditions
331 and NCDs within countries. These are largest in France, Germany and the United Kingdom, and smallest in
332 Denmark, Sweden and Norway. There were higher inequalities amongst women. Future research should
333 explore the underlying reasons for these inequalities. These large relative and absolute differences across
334 Europe imply that a more concerted effort at both the national and EU level is needed to tackle regional
335 inequalities. Successfully evaluated interventions shown to reduce regional health inequalities should be
336 adopted across Europe (perhaps using EU structural funds), coordinated by policy makers in order to plan
337 and deliver successful public health strategies to harmonise regions and finally realise the aims of the ECC
338 Treaty from 1957.

339

340 **6. Acknowledgements**

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342 NORFACE (New Opportunities for Research Funding Agency Cooperation in Europe) Welfare State Futures
343 programme (grant reference:462-14-110). For more details on NORFACE see www.norface.net/11.

344

345 **7. Tables and Figures**

346

347

348 **Table 1** Self-reported conditions and NCD variables taken from the ESS rotating module on ‘Social
349 inequalities in health and their determinants’.

Variable	Variable description and/or ESS question	ESS7 Question No.
Self-rated health (poor health)	How is your health in general? Would you say it is: <ul style="list-style-type: none"> • Very good • Good • Fair • Bad • Very bad Self-rated health graded poor/very poor (as oppose to fair/good/very good)	C7
Overweight/ obesity	Self-reported height and weight converted to BMI. Overweight/ obese (BMI > 25) as opposed to underweight/ normal (BMI < 25).	E11 E12
Mental health	Depression measured using the eight-item version of the Centre for Epidemiological Studies Depression Scale (CES-D8) ²⁵ dichotomised to above or below depression cut-off value (10 out of 24), as outlined in Huijts et al. ¹¹ .	E20-27
Heart or circulation problems	Which of the health problems [detailed below] have you had or experienced in the last 12 months? <ul style="list-style-type: none"> • Heart or circulation problems 	E28
High blood pressure	Which of the health problems [detailed below] have you had or experienced in the last 12 months? <ul style="list-style-type: none"> • High blood pressure 	E28
Back or neck pain/muscular or joint pain in hand/arm or foot/leg	Which of the health problems [detailed below] have you had or experienced in the last 12 months? <ul style="list-style-type: none"> • Back or neck pain • Muscular or joint pain in hand or arm • Muscular or joint pain in foot or leg 	E28
Diabetes	Which of the health problems [detailed below] have you had or experienced in the last 12 months? <ul style="list-style-type: none"> • Diabetes 	E28
Cancer	Do you have or have you ever had: <ul style="list-style-type: none"> • cancer affecting any part of the body • leukemia • malignant tumor • malignant lymphoma • melanoma, carcinoma, or other skin cancer 	E30

350

Table 2 Within country regional inequalities. Relative risk (high to low relative ratio) is shown between regions for the total population for each self-reported condition and NCD (confidence intervals at 95% shown in brackets). Significance using risk difference is signified with an asterisk (where $p < 0.05$).

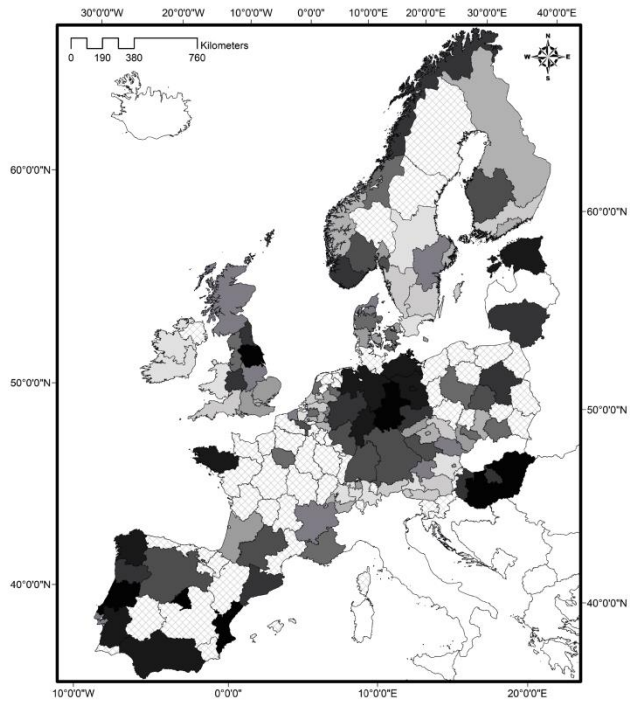
Country	Self-rated poor health	Overweight/obesity	Depression	Heart or circulation problems	High blood pressure	Pain	Diabetes	Cancer
Austria	0.311 (0.032 – 3.059)	0.659 (0.421 – 1.030)	0.629 (0.299 – 1.266)	0.341 (0.070 – 1.655)	0.198 * (0.044 – 0.890)	0.528 * (0.294 – 0.950)	0.284 (0.020 – 3.966)	0.361 (0.099 – 1.310)
Belgium	0.467 (0.133 – 1.648)	0.685 * (0.492 – 0.955)	0.295 * (0.115 – 0.755)	0.368 (0.123 – 1.101)	0.346 * (0.142 – 0.842)	0.695 * (0.540 – 0.893)	0.331 (0.083 – 1.321)	0.513 (0.192 – 1.367)
Czech Republic	0.491 (0.161 – 1.495)	0.680 * (0.529 – 0.875)	0.505 * (0.272 – 0.937)	0.329 (0.100 – 1.079)	0.539 (0.274 – 1.060)	0.448 * (0.293 – 0.686)	0.392 (0.097 – 1.584)	-
Denmark	0.653 (0.214 – 1.986)	0.857 (0.562 – 1.306)	0.613 (0.270 – 1.393)	0.559 (0.215 – 1.451)	0.646 (0.358 – 1.163)	0.910 (0.737 – 1.122)	0.625 (0.125 – 3.117)	0.517 (0.238 – 1.119)
France	0.528 * (0.323 – 0.863)	0.708 * (0.609 – 0.823)	0.519 * (0.319 – 0.844)	0.328 * (0.200 – 0.538)	0.501 * (0.341 – 0.734)	0.576 * (0.501 – 0.661)	0.466 * (0.255 – 0.852)	0.636 * (0.427 – 0.949)
Germany	0.413 * (0.243 – 0.701)	0.596 * (0.496 – 0.715)	0.198 * (0.119 – 0.331)	0.520 * (0.368 – 0.736)	0.517 * (0.413 – 0.647)	0.757 * (0.668 – 0.858)	0.159 * (0.094 – 0.269)	0.616 * (0.449 – 0.845)
Hungary	0.606 (0.272 – 1.351)	0.728 * (0.583 – 0.910)	0.442 * (0.299 – 0.652)	0.190 * (0.053 – 0.685)	0.127 * (0.040 – 0.397)	0.338 * (0.188 – 0.607)	0.306 (0.068 – 1.377)	0.216 * (0.088 – 0.531)
Netherlands	0.478 (0.182 – 1.254)	0.588 * (0.364 – 0.951)	0.538 (0.214 – 1.353)	0.464 * (0.220 – 0.976)	0.713 (0.408 – 1.247)	0.473 * (0.261 – 0.859)	0.511 (0.143 – 1.822)	0.616 (0.270 – 1.405)
Norway	0.392 (0.095 – 1.609)	0.639 * (0.453 – 0.903)	0.339 (0.066 – 1.734)	0.585 (0.139 – 2.465)	0.524 (0.220 – 1.244)	0.771 (0.576 – 1.031)	0.226 (0.018 – 2.880)	0.456 (0.139 – 1.501)
Poland	0.562 * (0.336 – 0.940)	0.601 * (0.490 – 0.737)	0.652 * (0.456 – 0.934)	0.820 (0.561 – 1.199)	0.468 * (0.313 – 0.700)	0.454 * (0.348 – 0.593)	0.649 (0.307 – 1.372)	0.392 * (0.205 – 0.749)
Portugal	-	0.734 (0.556 – 0.969)	-	-	-	0.689 * (0.467 – 1.018)	-	-
Spain	0.590 * (0.357 – 0.978)	0.815 * (0.637 – 1.041)	0.655 * (0.440 – 0.975)	0.464 * (0.247 – 0.872)	0.652 * (0.436 – 0.974)	0.628 * (0.494 – 0.798)	0.565 (0.263 – 1.213)	0.647 (0.299 – 1.399)
Sweden	0.373 (0.089 – 1.559)	0.799 (0.615 – 1.038)	0.574 (0.218 – 1.507)	0.516 (0.224 – 1.190)	0.663 (0.340 – 1.293)	0.712 * (0.571 – 0.887)	0.381 (0.096 – 1.508)	0.411 * (0.178 – 0.946)
Switzerland	0.165 * (0.028 – 0.985)	0.689 (0.453 – 1.048)	0.554 (0.210 – 1.463)	0.499 (0.172 – 1.447)	0.818 (0.368 – 1.819)	0.731 * (0.565 – 0.947)	0 (0 – ∞)	0.560 (0.294 – 1.066)
United Kingdom	0.233 * (0.119 – 0.454)	0.634 * (0.563 – 0.714)	0.403 * (0.286 – 0.569)	0.329 * (0.198 – 0.549)	0.572 * (0.440 – 0.744)	0.705 * (0.599 – 0.831)	0.362 * (0.184 – 0.712)	0.432 * (0.267 – 0.701)

Table 3 Absolute weighted mean difference from the overall mean calculated for the percentage of overweight/obesity for females and males separately. Countries weighted by population (from table 'demo_r_d2jan' taken from Eurostat). Countries are ordered by their high to low absolute difference (taken from Figure 2).

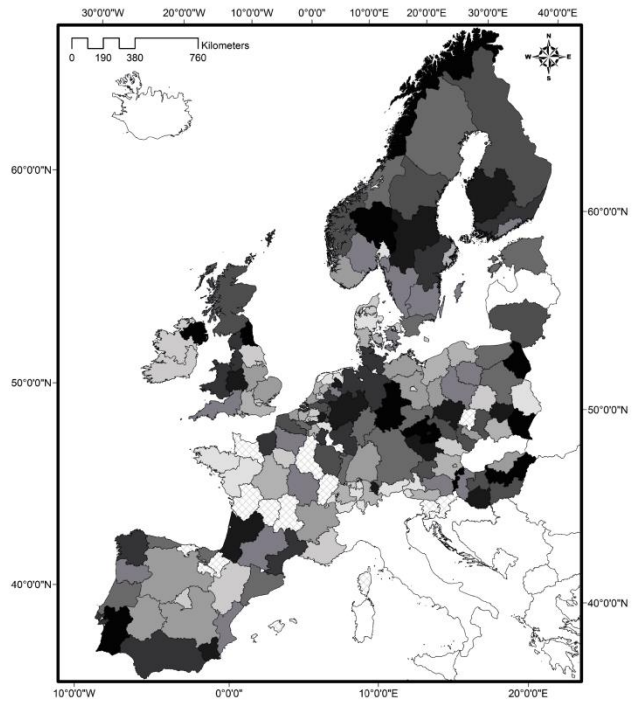
FEMALES			
Country		Weighted mean difference	Weighted mean difference (order)
1	Norway	9.579	1
2	Czech Republic	7.416	3
3	France	6.531	4
4	Germany	5.919	5
5	United Kingdom	5.092	8
6	Hungary	8.056	2
7	Netherlands	3.019	13
8	Belgium	3.846	11
9	Poland	3.877	10
10	Portugal	4.047	9
11	Austria	5.315	7
12	Spain	5.587	6
13	Sweden	3.725	12
14	Switzerland	1.809	14

MALES			
Country		Weighted mean difference	Weighted mean difference (order)
1	United Kingdom	6.648	2
2	Spain	5.153	5
3	Czech Republic	7.729	1
4	Austria	3.162	12
5	France	6.375	3
6	Germany	3.997	11
7	Poland	4.527	6
8	Sweden	4.096	10
9	Belgium	4.152	9
10	Hungary	5.643	4
11	Switzerland	4.492	7
12	Netherlands	4.217	8
13	Denmark	2.283	13
14	Norway	1.938	14

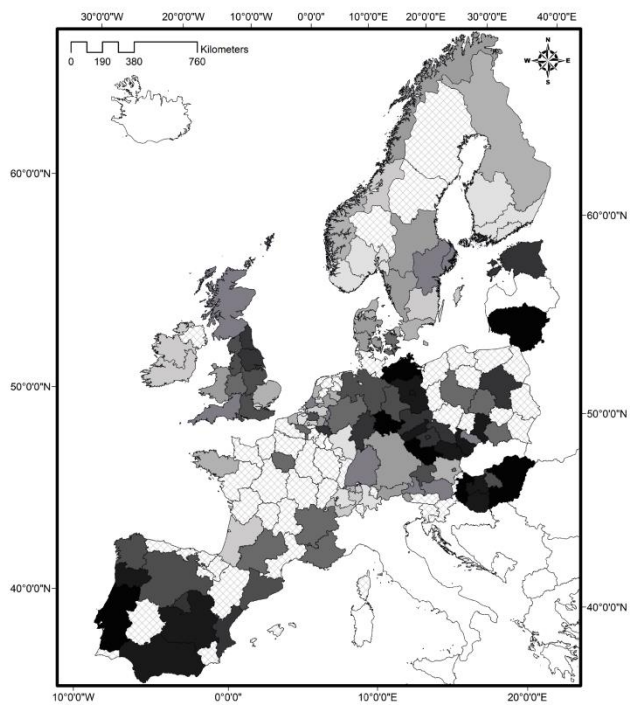
Self-rated poor health



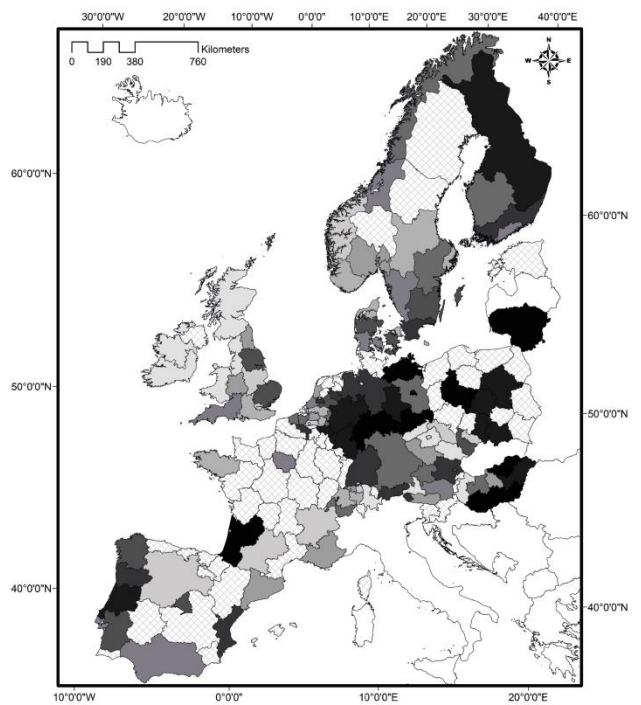
Overweight and obese



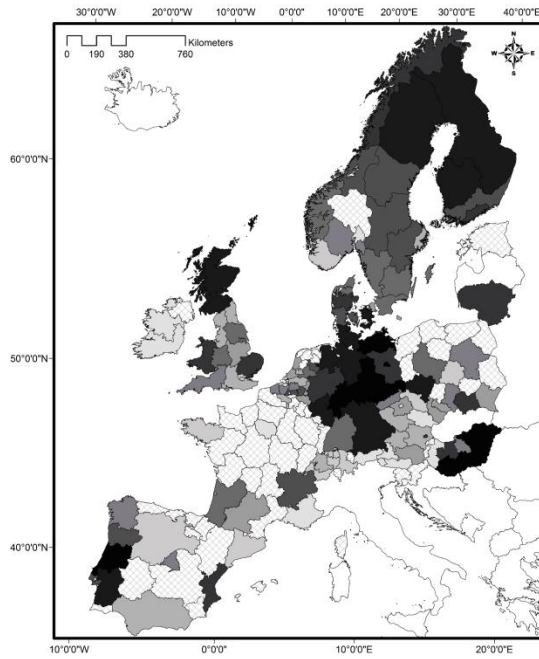
Mental health



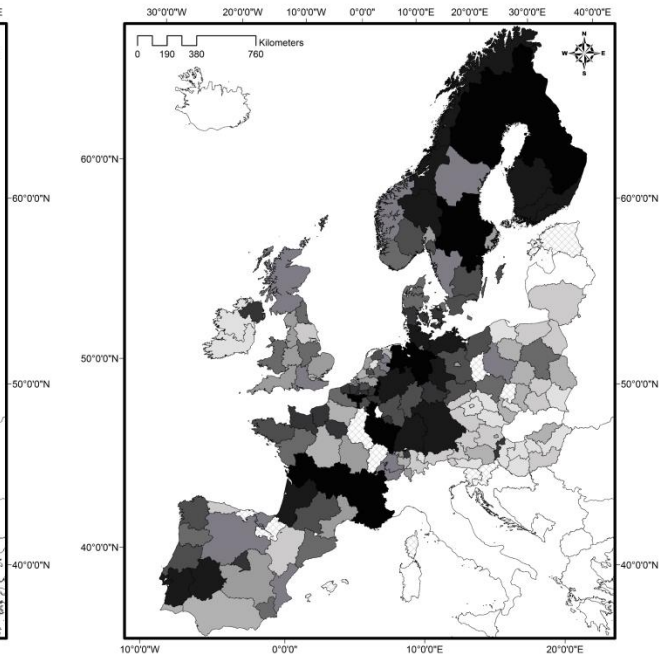
Heart or circulation problems



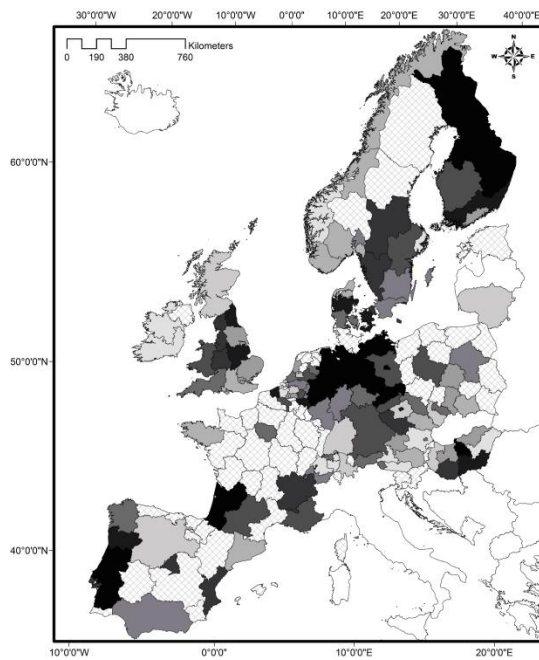
High blood pressure



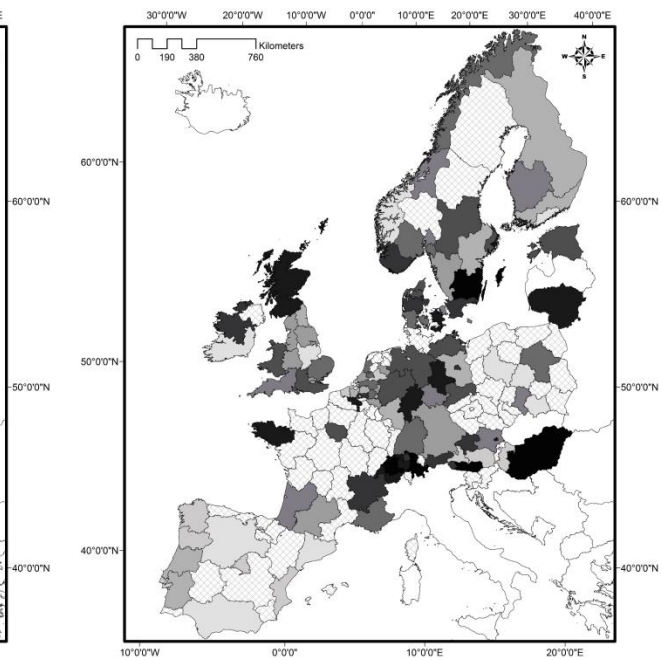
Back or neck/ muscular or joint pain in hand/arm or foot/leg



Diabetes



Cancer



Legend

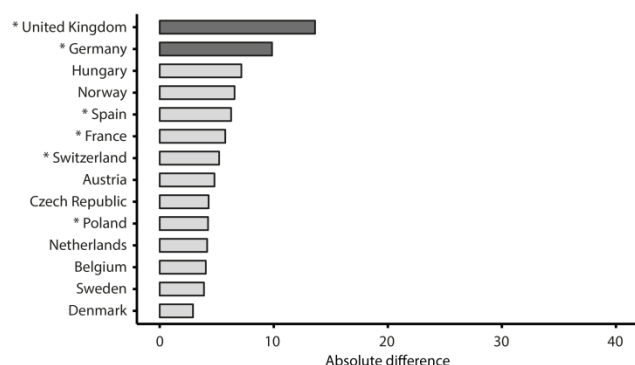
Deciles of self-reported chronic conditions in percent (where 1: most healthy; 10 = least healthy)



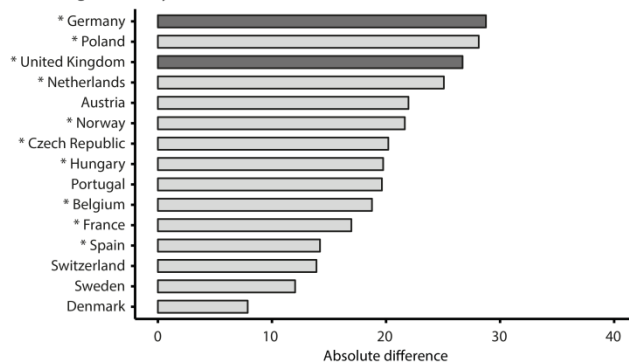
 European countries in ESS analysis with insufficient health outcome data for regional analysis

Figure 1 Regional prevalence's in self-reported conditions and NCDs for the total population at NUTS 2 (except for Germany and the UK where data are only available at NUTS 1). Administrative boundaries from EuroGeographics.

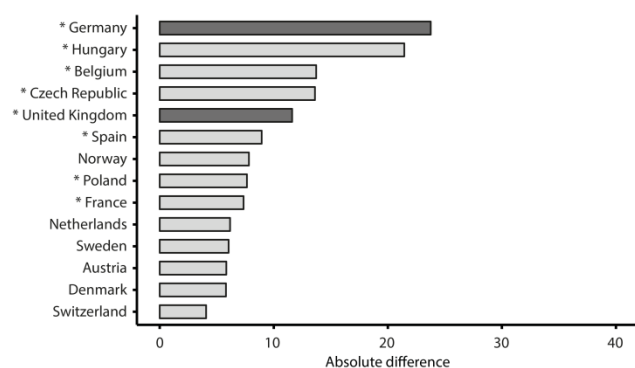
Self-rated poor health



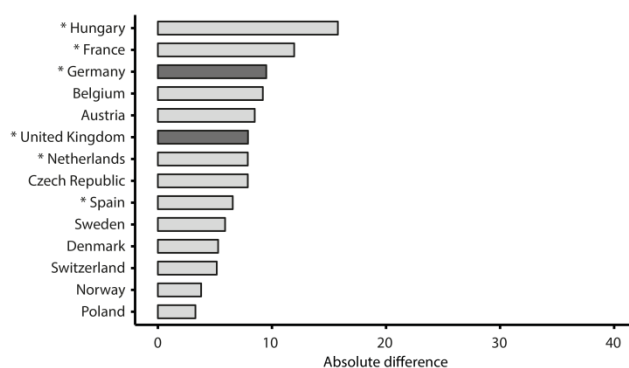
Overweight/obesity



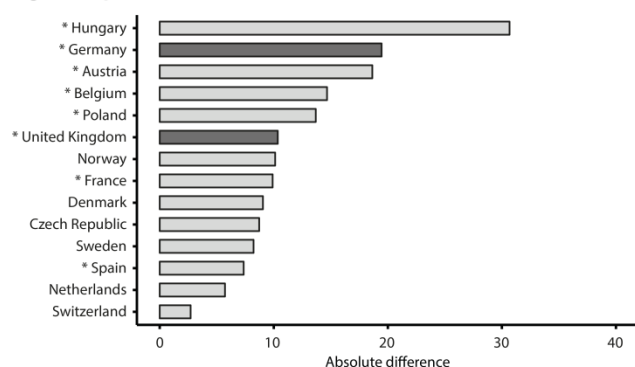
Mental health



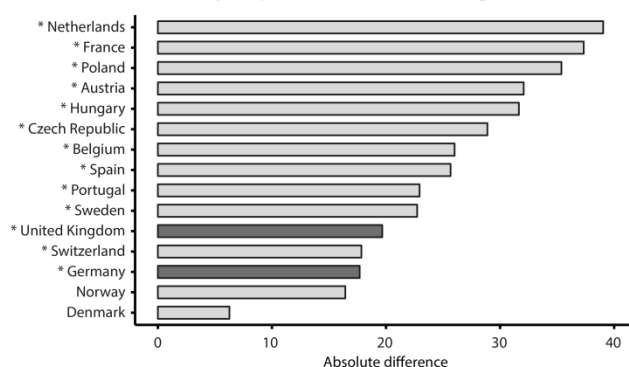
Heart or circulation problems



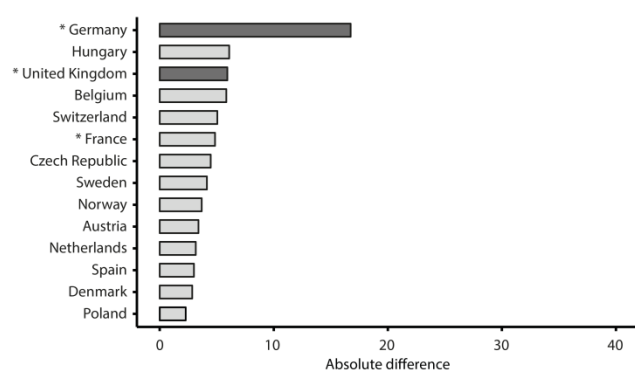
High blood pressure



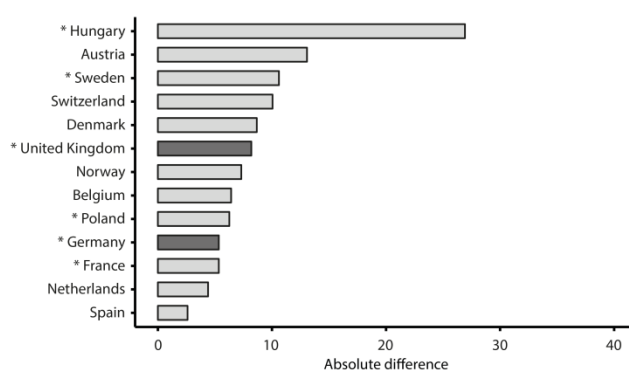
Back or neck/ muscular or joint pain in hand/arm or foot/leg



Diabetes



Cancer



Analysis at NUTS 1 level



Analysis at NUTS 2 level

Figure 2. Regional inequalities in self-reported conditions and NCDs. The high to low absolute difference (in percentage points) represents the within-country difference in regional prevalence of each of the self-reported conditions. The asterisks represents countries which have a significant risk difference (where $p < 0.05$).

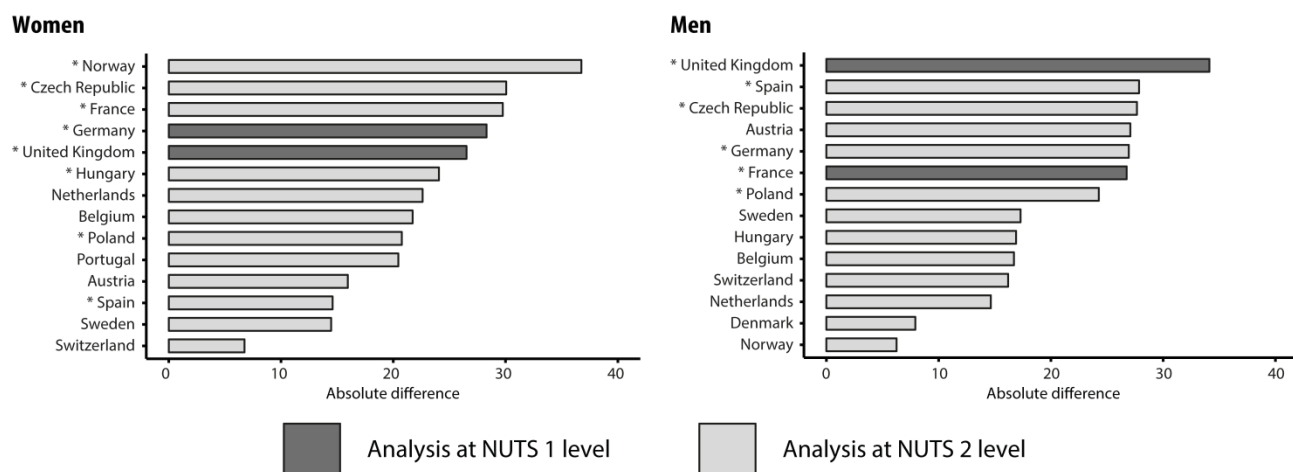


Figure 3 Country-level regional inequalities in overweight/obesity status in women (left) and men (right). The high to low absolute difference (in percentage points) represents the within-country difference in regional prevalence in the prevalence of overweight/obese status. The asterisks represents countries which have a significant risk difference (where $p < 0.05$).

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